PROVINCE OF NEW BRUNSWICK

1990 ANNUAL REPORT RELATING TO THE
CANADA/NEW BRUNSWICK AGREEMENT
RESPECTING A SULPHUR DIOXIDE
EMISSION REDUCTION PROGRAM
FOR THE CALENDAR YEAR 1989

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Executive Summary

The Province of New Brunswick has agreed to reduce annual emissions of sulphur dioxide to 185,000 tonnes by 1994.

This report to the federal Minister of the Environment details how New Brunswick is ensuring that this will happen.

Some 85% of acid causing emissions in New Brunswick are produced by the combustion of fuels to supply our energy needs.

An SO_2 emission control program from N.B. Power was incorporated in the documentation evaluated as part of the Belledune Environmental Impact Assessment process. It was updated in 1990.

It is anticipated that the non-utility sector of the economy will continue to be responsible for less than 30% of the provincial emission target.

The report briefly summarizes recent acid deposition data. New Brunswick's monitoring effort in this regard has expanded significantly. Deposition targets for sulphate are being reassessed for adequacy of protection for various areas of the province.

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Introduction:

The Canada/New Brunswick Agreement, signed in 1987, confirmed our resolve to participate with the other eastern Canadian provinces in reducing emissions of acid rain causing sulphur dioxide emissions by 50%. New Brunswick is a minor contributor to the North American total, but has offered a significant reduction and will continue to study the need for further reductions to protect local environments.

The prime purpose of the New Brunswick Agreement and those completed between Canada and the other eastern provinces was to formalize the negotiated reductions. The agreements require regular reporting of progress to the other partners and the public, and provide information to assist in the development of a similar agreement with the United States.

This report will summarize the impact of long-standing provincial policies and legislation on SO_2 emissions, progress since 1980, projections for the future, control options, and monitoring efforts.

New Brunswick has agreed to an annual emission target, to be achieved by 1994, of no more than 185,000 tonnes of sulphur dioxide. Thus far in the 1980's, emission rates have fluctuated widely depending on various economic forces. The new policies being introduced by the Province will be targeted at a longer term solution to these wide fluctuations and overall emission reductions.

A large portion of the emission fluctuation in New Brunswick is a result of our electric power interconnections with other provinces and states. The Province is often called upon to assist other utilities facing shortages or unplanned equipment outages.

For example, a cable across the Northumberland Strait to supply electrical energy from New Brunswick enabled Prince Edward Island to fully meet their SO_2 Reduction Agreement. Export sales of New Brunswick electricity during 1989 to Quebec, Nova Scotia and to U.S. utilities helped these jurisdictions avoid utilization of their fossil-fueled thermal units, serving to reduce their emissions.

Although New Brunswick has a very diversified electrical generation system, these interconnections and the agreements that surround them exact a price in terms of emissions, as increased demand means additional load on our fossil-fuel units. However, our geographical location is such that the interconnections are essential for the provision of safe, reliable electric power in eastern Canada and the U.S. This report will show how N.B. Power plans to accommodate such unexpected demands while still meeting New Brunswick's commitment on emission reductions.

Legislation:

The New Brunswick Clean Environment Act furnishes the authority under which releases of contaminants into the environment are regulated. The Air Quality Regulation under that Act specifies approval requirements, sets air quality standards, and limits the sulphur content of fuel oils. The Environmental Impact Assessment Regulation also requires that emissions from many new or modified sources are reviewed in a much broader context, allowing public input to final decisions on controls.

Approvals are used to ensure that each local airshed is properly managed. In the past, this has meant emission restrictions to ensure that the ambient air quality standards were met with a margin set aside for future industrial growth. Now, as more is known about the impact of local sources on acid deposition, and as the Province enters into various agreements to limit the emission rate of sulphur dioxide and other pollutants, the same mechanism is available to adjust emission rates as required.

Policy:

The basic tenets of New Brunswick sulphur dioxide control policy are as outlined in our legislation. A maximum sulphur content has been set for petroleum products. However, where lower emissions are necessary on a continuous or an occasional basis, the approval system is used to reduce allowable fuel sulphur content or to require the use of supplementary fuels.

Industry has been permitted to emit only to the extent that accepted models would indicate that their impact will meet the federal guidelines for desireable sulphur dioxide concentration, which is one-half of the provincial standard, and only to an extent that the aggregate of the impact of all local sources ensure that the provincial standard is met.

This policy extends to existing sources, and has been successful in reducing the number of air quality stations recording exceedances of the Provincial hourly SO_2 standard. Average annual ambient concentrations at most stations have also shown significant decreases, indicating that the policy has served as a driving force to reduce emissions.

The recent agreements to limit total sulphur dioxide emissions to 185,000 tonnes annually also became driving forces for air quality management. More specific policy is applied to individual sources or source sectors as outlined below.

1. N.B. Power - Thermal Electric Power Generation

The province has been striving since the signing of the U.S.-Canada Memorandum of Intent to develop a comprehensive policy on sulphur dioxide emissions from this sector. This has been particularly difficult due to the interconnections with other provinces and the U.S., the unknown impact of federal policies the use of indigenous high sulphur coal, and the excess capacity on hand during the mid-1980's.

It became apparent that new generation was needed due to high demand growth and reduced availability of imports. N.B. Power developed a generation plan and an emission strategy plan. The emission strategy plan was in response to the determination that for the Province to meet its commitments to the Eastern Canadian SO_2 Reduction Plan and subsequent agreements, and to the New England Governors/Eastern Canadian Premiers Conference, total annual emissions of sulphur dioxide from thermal power generation must be limited to 130,000 tonnes. In addition to this so-called "Bubble" concept, the strategy requires that ambient air quality standards must be met and that the southwestern area of the province, which is most sensitive to acid deposition, should recieve added protection.

N.B. Power submitted this report for the government's technical review as part of the Belledune EIA process. It has recently been updated to account for recent decisions regarding the addition of new generation and reliance on new fuels.

N.B. Power operates four major thermal plants and is building a fifth plant at Belledune. The components of the preferred plan presented in the control program include:

1. Construction of a new unit with 90% (nominal) efficient controls for sulphur dioxide to burn Minto coal at Grand Lake (150-200 MW) by 1994.

2. Conversion of 200 MW of Minto coal-fired generation at Dalhousie to low sulphur fuel by 1994.

3. Construction of a new 450 MW coal-fired unit at Belledune by 1993 to meet the federal SO_2 emission guidelines.

4. Construction of a new 450 MW coal-fired unit at Belledune by 1997/98.

5. Utilization of lower sulphur oil in existing oil-fired units.

Utilization of Minto coal would be maintained at no more than 500,000 tonnes per year and exports of 4000 Gwh in 1994 would increase to 5000 Gwh by 2000. Environmental Impact Assessments are expected to examine in detail the impacts associated with the air and other emissions. As well, public hearings are required on these plans.

If current schedules and technical solutions can be achieved, the plan will result in the emissions as low as those shown in Column 2 of Table 1.

TABLE 1

SO_2 Emissions - NB Power
(tonnes per year)

Plant	1989	1994	2000
Coleson Cove	74,000	38,000	38,000
Dalhousie	60,300	36,000	13,000
Grand Lake	28,200	27,000	19,000
Courtenay Bay	14,000	5,000	5,000
Belledune	0	7,000	16,000
Other	400	0	0
	176,900	113,000	91,000

Table 1 indicates, after 1994, a relatively even distribution of the remaining emissions among Coleson Cove, Grand Lake and Dalhousie with significantly lower emission rates at plants located in areas where ambient air quality violations have occasionally been a problem in the past. Dalhousie emissions will be reduced even further in 1995 as Minto coal is completely replaced with 1% sulphur coal or equivalent.

N.B. Power also examined the potential of reducing the use of Bunker C at Coleson Cove by converting one unit to Orimulsion and adding a scrubber, reducing export sales, additional purchases (if available), blending Minto coal at Belledune should the new Grand Lake unit be delayed and nuclear alternatives. The report indicates that the limit of 130,000 tonnes annually can be achieved by 1994, and maintained until the year 2000 and beyond with a significant margin.

2. Pulp Mills

New Brunswick's eleven pulp mill complexes have submitted modernization plans designed to bring them into compliance with the Pulp and Paper Industry Emission Regulation. The construction projects are expected to be completed in 1990/91. Strong markets have created pressure for full production at all mills and expansion at some. However, it is anticipated that this sector will maintain sulphur dioxide emission levels of less than 15,000 tonnes per year although additional regulatory initiatives may be necessary.

3. Brunswick Mining and Smelting

This smelter is one of the best controlled in North America capturing 80-82% of the sulphur input to the plant. However, recent improvements in the monitoring system and new modelling studies indicate that due to low stack heights, flue gas temperatures and exit velocities, the complex cannot consistently meet New Brunswick air quality standards. In the short-term, the smelter has upgraded equipment and operating procedures at the sintering machine and within the acid plant. Medium-term changes such as new stacks have been examined and longer-term changes in the smelting process studied.

Further decisions on the approaches to be taken to resolve the ambient air quality concerns are expected to be taken shortly. These will result in additional emissions reductions, the magnitude of which are not yet known.

4. Irving Oil Refinery

The largest refinery in North America continues to operate at a high throughput and meet daily emission standards imposed at the time of its last expansion. This approval would allow up to some 8,000 tonnes per year of sulphur dioxide emission. The refinery typically operates well below this level.

5. Industrial Boilers

The province has developed an inventory of any boilers using Bunker fuel. Information on fuel use and sulphur content is updated regularly. This data is monitored closely to determine if the sulphur in fuel allowance must be tightened, generally or for specific sources.

6. Energy Supply

The Province continues to examine all options for meeting its energy needs, factoring in the emission standards to be achieved and emphasizing the need for improved energy efficiency. The use of wood waste continues to be encouraged. Proposals for the construction of a wood-fired electricity generation plant are being sought. N.B. Power plans to experiment with this fuel at its fluidized bed plant in Chatham. Pulp mills are continuing to use additional wood waste to meet their steam demands.

N.B. Power has modified their hydro-electric plant at Mactaquac and continues to investigate future changes and additions to their hydro system. However, no major new developments are likely in this area. The Commission plans a major review of all energy supply and demand management alternatives in 1990/91.

Current Emission Estimates:

Several major point sources have reported their 1989 annual emissions. For sources that have not reported, the data for the latest year is reported in Table 2. The "Other Sources" category includes smaller sources such as industrial and commercial boilers and data is supplied by Environment Canada. All 1989 data should be regarded as preliminary.

TABLE 2

Sulphur Dioxide Emissions
(tonnes/year)

Source	Emissions	Year
N.B. Power	176,900	1989
Pulp Mills	15,900	1988
Irving Oil Refinery	4,700	1989
Brunswick Mining & Smelting	21,100	1988
Other Sources	18,000	1985
Total	236,600	

Most sectors reporting to date indicate only minor changes from the previous year. The exception is N.B. Power where emissions increased by 12% over the previous year. This was caused by continued strong in-province demand growth and support to neighbouring utilities. As previously noted, plans have been developed to reduce emissions from this sector.

Emission Projections:

The above sections outline in general terms how New Brunswick is planning to meet the terms of the Agreement. The Province continues to closely monitor the emission totals resulting from these policies and will adjust the conditions of approvals or reduce the allowable sulphur content of fuels to ensure compliance with the Agreement.

During the period (1990-1994) while environmental hearings, approval processes, and construction activities proceed on the control options proposed by N.B. Power, the pulp mills and the smelter, provincial emissions will most likely range between 200-250,000 tonnes. Completion of the proposed projects in the period 1992-1995 will mean a lower, more stable emission rate by 1994 and beyond.

Deposition Trends:

It is difficult to assess completely the effect of sulphur dioxide emission reductions accomplished to date by the eastern Canadian provinces. Variation in meteorological parameters from year to year may to have had as much effect as the emission reductions. However, it appears that all deposition monitoring stations in New Brunswick that are located remote from major sources (more than 10,000 tonnes per year) have generally indicated deposition levels less than the 20 kg/ha-year target on a consistent basis. This target was set to protect moderately sensitive aquatic ecosystems and may need to be revised for some areas of the province. It is the amount of sulphate being deposited on the ground or water surfaces by precipitation in the form of rain, sleet, snow or heavy fog. While no objectives have yet been set for nitrate deposition, the data is presented in Table 3. Table 4 contains recent sulphate deposition data.

A cooperative program among the Department of the Environment, NB Power and Environment Canada expand this monitoring activity and resulted in increasing the number of active stations to 20. This level of effort will continue until May, 1990 to allow calibration of an acid deposition model and to more clearly define the deposition pattern across the province.

TABLE 3
Nitrate Deposition in New Brunswick
(kg/ha-yr)

Station	1983	1984	1985	1986	1987	1988
Acadia	*10.4	-	-	-	-	-
Grand Manan	14.5	*14.9	-	-	-	-
Nictau	11.1	11.4	10.4	9.3	6.1	10.2
Harcourt	7.5	9.2	6.7	9.3	5.8	8.9
Frog Lake	8.5	11.4	15.3	*17.6	-	-
Forest Hills	-	-	12.1	13.6	-	-
Lonewater Farm	-	-	9.8	10.2	3.8	13.3
Musquash	-	-	16.0	12.4	10.9	11.5
Darling's Island	-	-	9.4	15.8	7.5	9.7
Maguadavic Lake	-	-	-	*12.9	9.0	8.4

TABLE 4
ExcessSulphate Deposition in New Brunswick
(kg/ha-yr)

Station	1983	1984	1985	1986	1987	1988
Acadia	*15.3	-	-	-	-	-
Grand Manan	17.2	*27.4	-	-	-	-
Nictau	14.7	17.6	20.4	16.4	13.6	13.7
Harcourt	11.3	14.8	11.0	14.2	14.3	14.0
Frog Lake	16.7	25.8	19.8	*26.1	-	-
Forest Hills	-	-	36.7	31.2	-	-
Lonewater Farm	-	-	13.3	21.0	11.4	18.8
Musquash	-	-	22.7	24.4	19.3	20.3
Darling's Island	-	-	14.8	23.7	14.3	14.8
Maguadavic Lake	-	-	-	*19.1	13.7	13.1

* based on operation for partial year; data extrapolated to reflect a best estimate of full year deposition